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PETR ŠÍDA, PETR NERUDA, ANTONÍN PŘICHYSTAL, JAN EIGNER,
REBEKA RMOUTILOVÁ, PETR VELEMÍNSKÝ

# ARTEFACTS ASSOCIATED WITH THE EARLY MODERN HUMAN REMAINS FROM ZLATÝ KŮŇ HILL, CZECH REPUBLIC

*ABSTRACT: In the early 1950s, the bones of AMH Zlatý kůň 1 were discovered alongside a small collection of artefacts deep within the Koněprusy Caves system. Modern genetic research and dating techniques have placed this individual at the beginning of the modern human penetration of Europe, around 45,000 years ago. The small artefact assemblage consisted of six pieces of chipped stone industry, seven bones bearing traces of human impacts, and foreign seashell, which originated from either the Tertiary sediments of the Alpine Foredeep or the Mediterranean Sea. While the assemblage is not significant, it does not contain typical features of the younger, more evolved Aurignacian; rather, general analogies can be found in the Lincomb-Ranis-Jerzmanowice complex, which is documented at the closely related Ranis site.*

*KEY WORDS: Anatomically modern humans – Early Upper Palaeolithic – Lincomb-Ranis-Jerzmanowice complex – Central Europe – Artefacts*

## 1. INTRODUCTION

The search for the earliest evidence of anatomically modern humans (AMH) in Central Europe is one of the fundamental questions with which disciplines focusing on the Palaeolithic have been concerned for a long time. There are very few anthropological finds from this period, so each new discovery can significantly advance our understanding of it. Until recently, the only known remains were a collection of human skeletons found in the Mladeč cave complex, dating back to the end of the early Upper Palaeolithic (Teschler-Nicola 2006), thanks to which we can clearly link AMH to the developed Aurignacian culture. In recent years, two significant sets of anthropological remains have come to light, providing some of the earliest evidence of AMH in Europe: firstly,

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the anthropological remains from the Zlatý kůň site near Koněprusy in Central Bohemia were re-evaluated (Rmoutilová *et al*. 2018, Prüfer *et al*. 2021), and later the remains from the Ranis site (Mylopotamitaki *et al*. 2024), which are part of the Lincomb-Ranis-Jerzmanowice archaeological complex, were added.

This paper reevaluates the archaeological finds from Zlatý kůň near Koněprusy, proposing a new cultural-chronological classification. Correlating anthropological finds with the archaeological inventory could significantly contribute to discussions about recognising the oldest traces of AMH in European archaeological inventories.

### 1.1 Geographical settings

Zlatý kůň Hill (475 m a.s.l.), located near Koněprusy, lies in the western part of the Bohemian Karst, 30 km southwest of Prague (*Figure 1*, WGS 84: 49.91633°N, 14.06602°E). The Koněprusy Caves system, named after the nearby village, lies in a huge massif of high-quality Devonian limestones, which are still extracted at several quarries. Spanning 1.5 km across three levels, it is the largest cave system in Bohemia. The caves were discovered during blasting in the old quarry on 18 September 1950. This opened the way to the middle level, which was gradually explored that same year.

The middle floor's axis is the so-called Old Corridor, which runs from north to south and is 20 metres wide and 5 metres high in its central part. To the west lie the largest domes, the most important of which for archaeology is the northernmost, known as Prošek's (or the Main) Dome. This is a 50-metre-long, 20-metre-wide space, in the centre of which there is a massive stalagmite (*Figure* 2). This stalagmite stands at the foot of a debris cone formed by the collapse of material from two chimneys (the southern and northern) to the east. The reported anthropological and archaeological finds were found on the surface and in the sediments of the debris cone (Kukla 1952, Svoboda *et al*. 2003).

### 1.2 Archaeological and geological settings

The first anthropological find was made on 17 November 1950 at the base of the cone (*Figure 2*), at the interface of yellow-brown detritus and red clayey soil (layers D and F, *Figure 4*). This was the occipital part of a skull (Vlček 1952a). Shortly afterwards, on 18 December 1950, a commission of experts met at the site, comprising the anthropologist Emanuel Vlček, the archaeologist František Prošek, the geologist Jiří Kukla, and the Quaternary biologist Vojen Ložek. Following their recommendation, detailed archaeological research led by F. Prošek began in 1951 (Kukla 1952, Prošek *et al*. 1952).

Archaeological research was carried out in the cave from 1951 to 1953 (Fridrich, Sklenář 1976). Unfortunately, only the first season is documented in detail, in both the field report (Prošek, sd.) and the published articles based on it (most detailed in Prošek *et al*. 1952, Prošek 1952, and Vlček 1952a for the finds of human bones). For the remaining two seasons, only the primary documentation has survived, without the field diary or final report.

First, a passable entrance was made through the northern chimney from the surface, and subsequently

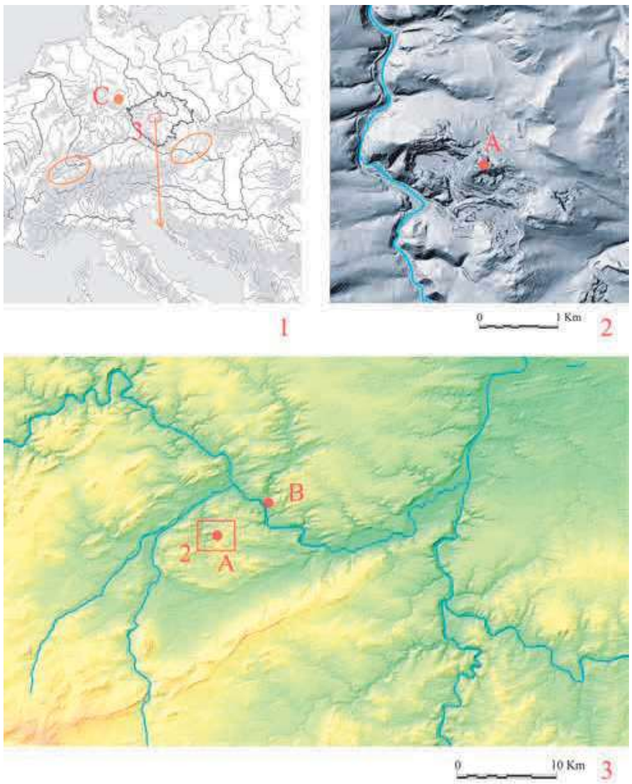


FIGURE 1: The Koněprusy Caves at Zlatý kůň Hill. Site location on a map of Central Europe (1), detailing the Bohemian Karst region (3) and Zlatý kůň Hill (2). Legend: A – Koněprusy Caves, Prošek's dome; B – Nad Kačákem Cave; C – Ranis site; orange area – tertiary sediments of Vienna basin and Alpine Foredeep with fossil presence of *Glycimeris* seashells; orange arrow – former nearest presence of *Glycimeris* seashells.

material was brought up through this space. Since the upper layers of the cone were loose and had a considerable slope, a tailored research method had to be adopted. In the area where the cone was longest, a longitudinal trench 2 m wide was excavated in the first year, and profiles I and II were documented along its sides (*Figures 2 and 4*). During the research, the sondage was divided into two-metre sections and excavated in individual squares to enable the position of finds to be checked. The plan included both artefacts and human bone finds, while palaeontological finds were linked to individual squares (Prošek *et al*. 1952).

Furthermore, F. Prošek writes that research continued in the south in 1951. The area to the south of the trench was divided into 2 × 2 m squares and excavated in the same way as before, leaving a 1 m wide control profile between the trench and the excavated area (Prošek *et al*. 1952). Localised finds of artefacts came from this area (the first was found on 16 April 1951, and the remaining four on 22 April 1951). During this phase, transverse profiles were documented in the southern part of the excavated area (Prošek *et al*. 1952). The control block was removed before the depth trenches were dug.

The surviving documentation and publications tell us little about the 1952 and 1953 seasons. However, from the drawings of the profiles and the plan (*Figure 2*), it is clear that research continued in the same way to the north for a distance of 8 m. At a distance of 4 m from Profile II, a parallel longitudinal Profile III was documented (*Figure 3*), which extended to the northern chimney fill. The data on the human bone finds provide us with at least a general idea of the progress of the research: the thoracic vertebra was found on transversal Profile II/1 in 1952, and the maxilla on transversal Profile III/5 in 1953. Thus, the research advanced from south to north.

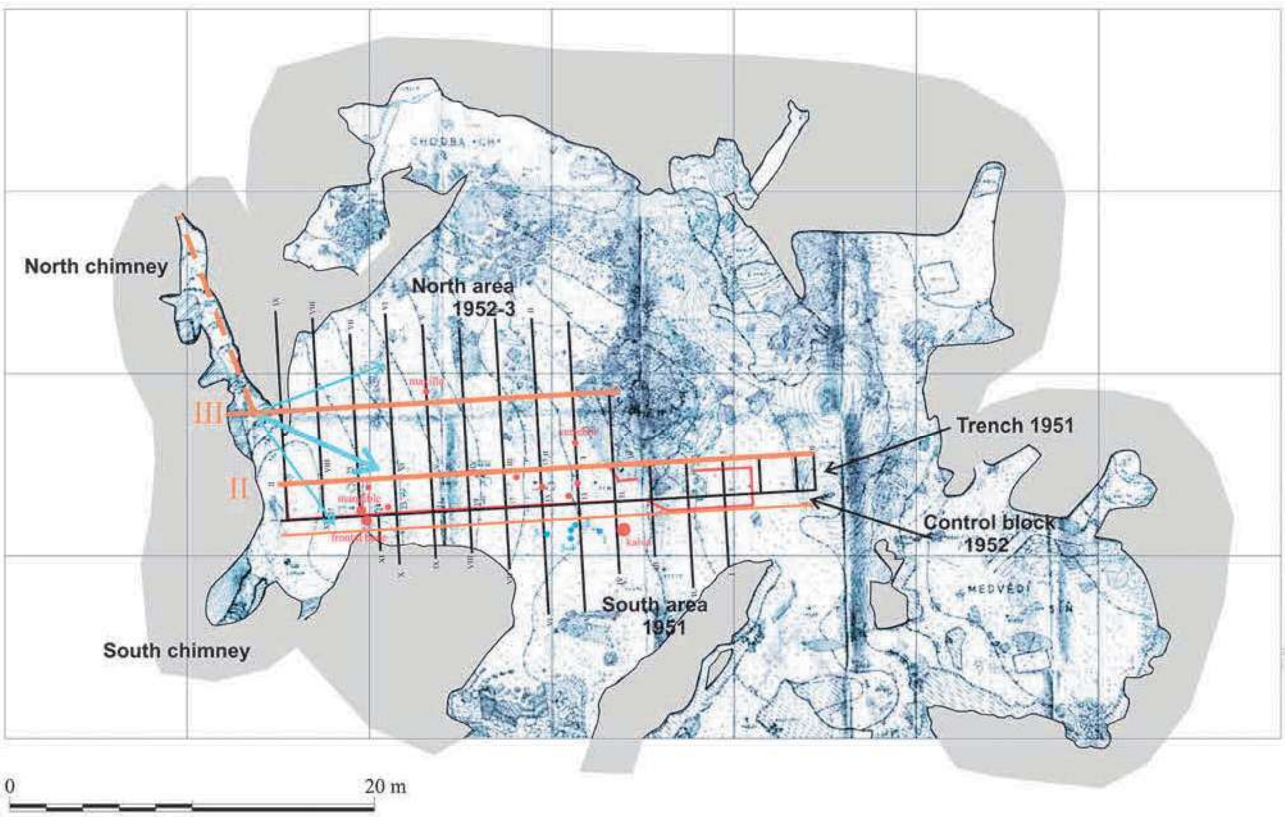


FIGURE 2: The Koněprusy Caves at Zlatý kůň Hill. Plan of Prošek's (Main) Dome with the locations of profiles (black and orange lines) and finds. Legend: black lines – profiles; orange lines – main profiles, wide line – Profiles II and III; red points – anthropological finds with first find highligted (kalva); blue points – artefacts, blue arrows – direction of material movement.

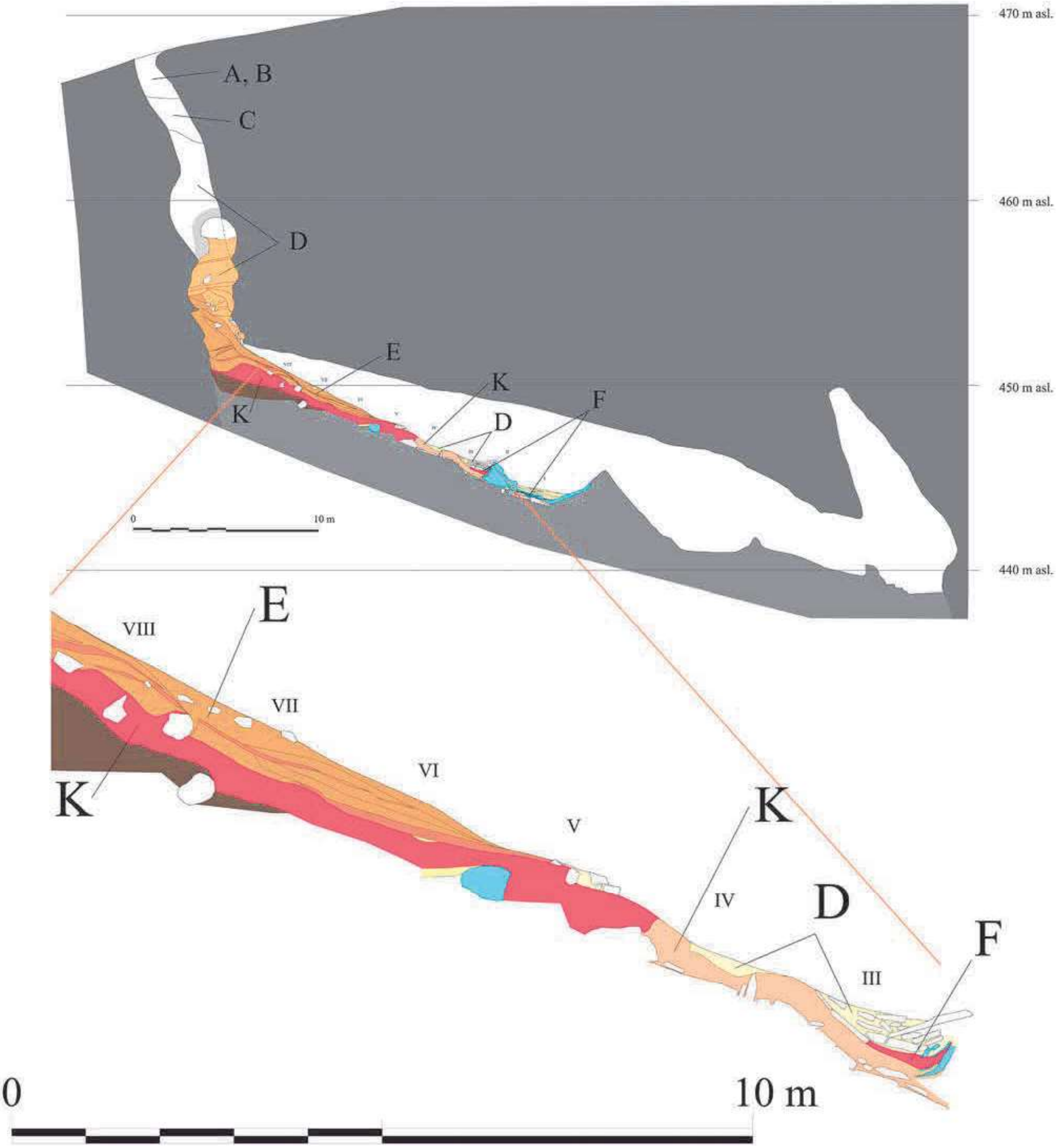


FIGURE 3: The Koněprusy Caves at Zlatý kůň Hill. Profile III through the whole site with northern chimney and detail of the middle part of Profile III. Labeling of layers see text. Layer H not visible in this scale.

## 2. MATERIALS AND METHODS

The archaeological excavation carried out in the 1950s used the standard methods and procedures of the time. However, environmental samples were not taken (except for fauna), and sediment flotation was not conducted. Unfortunately, this means that there are almost no usable sediment remains available today (except in the difficult-to-access distal parts of the fan). Therefore, revision excavation is out of the question at this time, and we must rely solely on information from the original research. Furthermore, the premature death of F. Prošek resulted in incomplete find reports. Consequently, we can rely only on primary field documentation and several published partial preliminary reports (Kukla 1952, Prošek sd., Prošek *et al.* 1952, Vlček 1952a, 1952b, 1957).

The collected malacofauna and vertebrate fauna were determined during the initial research by V. Ložek and Z. Hokr. The basal fauna was later revised and re-dated by Wagner *et al*. (2009) and Wagner and Čermák (2012). The condition of all the osteological finds was very poor: the researchers described the bones as being in a state ranging from soft to gooey, and they were preserved *en masse* soon after removal. The exact conservation procedure is unknown, Vlček's (1957) description covering only part of it. According to new genetic analyses of the anthropological material, an adhesive of animal origin was used, which makes dating extremely difficult.

Since Prošek's death (1958), the archaeological artefacts have been stored in the collections of the Anthropology Department at the Natural History Museum of the National Museum in Prague. We evaluated them using a standard descriptive method using technological and typological description (Inizan *et al.* 1999). In particular cases, we use principes of scar pattern analysis (e.g. Kot 2012, 2024) with special focused on the determination of scar sequences and morphology of butts. The raw materials were initially identified macroscopically, and then refined by measuring magnetic susceptibility and material density, as well as by inspecting the microstructure under a binocular magnifying glass using the water immersion method. We used an extensive comparative collection of raw materials stored in the Lithotheque of the Department of Archaeology and Museology of the Faculty of Arts at Masaryk University in Brno, Czech Republic, as reference data.

We adopted already published radiocarbon data for our needs, which we then recalibrated using the OxCal version 4.4 program (Bronk Ramsey 2001) and the IntCal20 curve (Reimer *et al*. 2020).

## 3. RESULTS

### 3.1 Stratigraphy

The stratigraphy is described in most detail in the work of Prošek *et al.* (1952), and can be checked against the original field report (Prošek sd.). However, this report was created before the depth trenches were digged out, so does not contain a description of the deepest parts of the sedimentary record, which are reflected only in publication. The description of the basal parts of the stratigraphy is not essential to our topic, so we will not discuss it further. For the stratigraphic issues of this article, Profile III (*Figure 3*) is important as it is closest to the northern chimney fill. However, it does not logically reflect the southern chimney fill, which is clearly visible on parallel Profile II (*Figure 4*). An overview of all layers is provided in *Table 1*.

In the lower half of the trench, above the collapsed blocks, there is a layer of red clayey soil (Layer K) containing the fossilised bones of Pleistocene mammals of the Vertebrate Fauna 1 (VF1) Horizon. According to Z. Hokr, this horizon was represented by *Ursus spelaeus* Blmb., *Bos* or *Bison* sp., *Cervus* sp. and *Lepus* sp. (Prošek *et al*. 1952). The bear has since been reclassified as *Ursus deningeri* (Wagner, Čermák 2012). Towards the top of the cone, this layer becomes strongly clayey and completely sterile, appearing only in local depressions (*Figures 3 and 4:K*).

In the lower section of the trench, the layer is covered by a solid sinter coating, above which is a dark reddish-brown clayey soil (Layer J). The lower part is sterile and has probably been redeposited, but the upper part, under the southern chimney, contained typical interglacial Mollusc Fauna (MF1) with *Heligocena čapeki* Pbk., *Aegopis verticillus* Fér., *Retinella nitens* Mich., and *Eulota fruticum* Mül. (Prošek *et al*. 1952). The yellow-brown soil (Layer I) – containing detritus inserts and sinter layers, as well as VF2 comprising *Vulpes* sp., *Cervus elaphus* Lin., *Lepus* sp. (determined by Hokr), and MF2 comprising *Eulota fruticum* Mül., *Monarcha incarnata* Mül., *Euomphalia strigella* Drap., *Helicigona lapicida* L. (determined by V. Ložek) – probably dates to the same period. The presence of *Celtis* seeds has also been documented (Prošek *et al*. 1952).

This layer is covered by one of locally cracked sinter (Layer H), after which the southern chimney was filled with a layer of yellow-brown, loess-like clay containing fine limestone detritus (Layer G). This layer completely closes the chimney.

Following the deposition of red-brown soil (layer J) and yellow-brown soil (layer I), as well as the formation

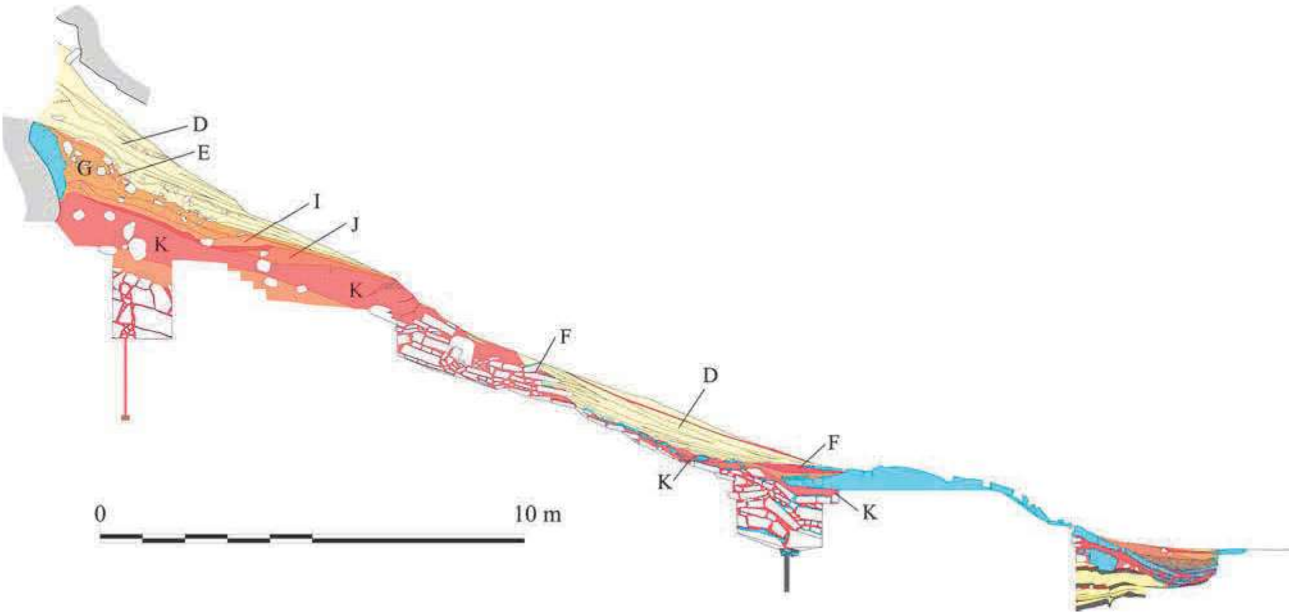


FIGURE 4: The Koněprusy Caves at Zlatý kůň Hill. Main Profile II. Labeling of layers see text. Layer H is not visible in this scale.

TABLE 1: The Koněprusy Caves at Zlatý kůň Hill. Overview of the stratigraphy of the site. VF – vertebrae fauna, MF – malacofauna.

| **Layer** | **Upper part of the debris cone and the northern chimney** | **Lower part of the debris cone** | **Finds** | **Dating** | **Remark** |
|---|---|---|---|---|---|
| A | gray-brown crumbly soil | | | Holocene | |
| B | white-yellow sinter layer | Holocene sinter | | Holocene | |
| C | yellow-brown loess with fine limestone debris | | | MIS 2 | |
| D | yellow-grey loose fine and coarse detritus with dark fossilized bones | yellow-grey loose fine and coarse detritus with dark fossilized bones | *Homo sapiens*, VF3, artefacts | MIS 3 | |
| E | brownish-grey loose detritus | sinter coatings | MF3 | start of MIS 3 | |
| F | a layer of displaced reddish-brown clay and brownish-red clay | a layer of displaced reddish-brown clay and brownish-red clay | | erosion and resedimentation during downwards transport hiatus | |
| G | yellow-brown clay with detritus | | | Lower Pleistocene | |
| H | sinter coatings | sinter coatings | | Lower Pleistocene | not visible on profiles II and III |
| I | yellow-brown clay with detritus and sinters | sinter coatings | VF2, MF2, *Celtis* | Lower Pleistocene, Biharien | |
| J | reddish-brown clay with detritus | sinter coatings | MF1 | Lower Pleistocene | |
| K | reddish-brown clayey soil with whitish fossilized bones | reddish-brown clayey soil with whitish fossilized bones | VF1 | Lower Pleistocene, Biharien | |

of sinter, material was displaced. This is clearly evidenced by the presence of lenses of red-brown and red soil arranged in a thatch-like pattern at the lower end of the trench (Layer F).

Subsequently, erosion stopped and sinter formed on the surface of the displaced layers. Together with this, brown-grey fine grained detritus (Layer E) containing MF3, including *Monarcha incarnata* Mül., *Eulota fruticum* Mül., *Arianta arbustorum* L., *Isognomostona personatum* Lm., *Helicodonta obvoluta* Mül., *Helix pomatia* L., *Cochlodina laminata* Mtg., *Helicella striata* Mül., *Euomphalia strigella* Drap., *Valonia costata* Mül., *Stagnicola palustris* Mül., *Radix lagotis* Schr. and *Succinea* sp. was sedimented in the cone (determined by V. Ložek, Prošek *et al.* 1952).

The aforementioned layers are overlain by a layer of yellow-grey, fine grained detritus (Layer D), which originates from the northern chimney and contains the dark fossilized bones of VF3. This fauna is represented by the species *Canis lupus* Lin., *Hyaena spelaea* Gold., *Equus cabalus* Lin., *Coelodonta antiquitatis* Blmb., *Bos* nebo *Bison* sp., *Rangifer tarandus* L., *Cervus* sp. *Lepus* sp. and *Marmota* sp. (as determined by Z. Hokr). Larch charcoal (*Larix decidua*) was also found (Prošek *et al.* 1952). Alongside this fauna, human bones and artefacts accompanied by a *Glycimeris* sp. seashell (identified by V. Ložek and revised by L. Juřičková) and bones with human impacts were also discovered.

This detritus also filled two-thirds of the northern chimney, through which the remains of animals and humans, as well as artefacts, reached the depths of the cave. The northern chimney is closed by loess sediment (Layer C), Holocene soils (Layer A) and sinter (Layer B).

### 3.2 Dating of the finds

At the time, the fossils were often assigned to the Würm 2 (~70–38ka BP; Prošek *et al.* 1952, Prošek 1952, Vlček 1971), which broadly matches Marine Isotope Stage 3 (59–24ka BP), in accordance with the layers containing the human remains, stone artefacts and faunal remains. The southern chimney was filled with sediments long before the formation of Layers D and E during the Lower Pleistocene. Between the formation of the basal part of the debris cone and Layer D with malacofauna (MF3), fauna (VF3), human fossils and artefacts, there is a long hiatus in sedimentation. Analysis of the vertebral fauna (VF3), layer D was dated at the time to the Würm 1 or Würm 2, which would now be correlated to the period before MIS 2.

The richest molluscan fauna, MF3, in Layer E, shows that the climate must at the very least have been almost as warm as that of the present. The dominant formation was forest, locally interrupted by enclaves of a steppe-like character. Currently, this type of malacofauna can be dated in Central European karst areas to the early interstadials of MIS 3 that represents GIS 14–16 – in current terminology.

Churchill *et al.* considered the Zlatý kůň fossils to be older than 30,000 years (Churchill *et al.* 1999, Tab. 1, p. 33 in ref. 27) and this age was also mentioned by J. Svoboda (2000). A first attempt at direct dating was made in 2002: a bone fragment 4 × 2 mm in size, most likely from the base of the cranium, was directly dated by J. Svoboda, resulting in a radiocarbon date of 12,870±70 $^{14}$C BP (GrA-13696), which corresponds to the Magdalenian archaeological techno-complex described in other sites across Bohemia (Svoboda *et al.* 2002, Svoboda *et al.* 2004). An additional attempt to date a human rib fragment yielded an estimate of 4,900±70 $^{14}$C BP (GrA-23102) and was deemed unreliable due to low carbon content (Svoboda et al. 2004). Dating of a rhinoceros bone from a similar context was unsuccessful because no collagen was preserved (Svoboda *et al.* 2004). These dates were too low in comparison to the stratigraphy, but it was thought that the Magdalenian one was reliable (*Table 2*).

Later, the initial $^{14}$C dating of tufa from the Koněprusy Caves yielded dates of over 21,000 years (Suchý *et al.* 2001). Another more detailed dating of calcite coverages preserved today on the walls of Prošek's Dome was done by J. Svoboda. The first two measurements are from the upper part of the Dome, below the lower entrance of the main (northern) chimney, and the other two are from the wall in the lower part of the Dome (Svoboda *et al.* 2004). In both cases, the age fits a time span of over 40 ka BP, when according to the stratigraphy the basal part of the layers containing archaeological and human finds formed (*Table 2*).

Additional dating was performed in connection with a genetic study of the bones at the Klaus Tschira Archaeometry Centre in Mannheim, Germany, on the detached right zygomatic bone. This resulted in an age of 23,080±80 $^{14}$C BP (MAMS-36077), more than 10,000 radiocarbon years older than the previous date (*Table 2*). The authors therefore suspected the presence of contamination on the specimen and sent the remaining collagen and zygomatic bone fragment for additional dating at the Oxford Radiocarbon Accelerator Unit (ORAU), where radiocarbon dating was performed

TABLE 2: The Koněprusy Caves at Zlatý kůň Hill. Overview of obtained $^{14}$C dates. Unmodelled data – 95.4%.

| Lab code | context | BP | 1sigma | cal BP on 2 sigma | | | references |
|---|---|---|---|---|---|---|---|
| GrA-13696 | cranium bone fragment | 12870 | 70 | 15611 | - | 15169 | Svoboda *et al.* 2002, Svoboda *et al.* 2004 |
| GrA-23102 | human rib | 4900 | 70 | 5886 | - | 5476 | Svoboda *et al.* 2004 |
| - | rhinoceros bone | no collagen | | | | | Svoboda *et al.* 2004 |
| GrN 27512 | calcite 1 outside | > 41300 | | | - | | Svoboda *et al.* 2004 |
| GrN 27522 | calcite 1 inside | > 45000 | | | - | | Svoboda *et al.* 2004 |
| GrN 27513 | calcite 2 outside | > 39800 | | | - | | Svoboda *et al.* 2004 |
| GrN 27523 | calcite 2 inside | 45500 | +2800–2000 | 55000 | - | 45000 | Svoboda *et al.* 2004 |
| MAMS-36077 | zygomatic bone | 23080 | 80 | 27605 | - | 27220 | Prüfer *et al.* 2021 |
| OxA-38022 | zygomatic bone | 29650 | 750 | 35699 | - | 32101 | Prüfer *et al.* 2021 |
| OxA-38602 | zygomatic bone | 15537 | 65 | 18936 | - | 18716 | Prüfer *et al.* 2021 |

using a compound specific approach that consisted of isolating and dating the amino acid hydroxyproline (HYP) present in the collagen. The new radiocarbon date that resulted was 29,650±750 $^{14}$C BP (OxA-38022, *Table 2*), corresponding to a range of 35,700-32,100 calBP with a 95.4% probability (Prüfer *et al.* 2021).

Due to the large discrepancy in the three dates (GrA-13696, MAMS-36077 and OxA-38022), and based on the Py-GC/MS results obtained on the bone powder and on the extracted collagen, the last 500 mg of bone powder left from the same bone fragment was used to date the specimen again using the ORAU pretreatment AG* described above, but followed by a step of ultrafiltration (coded AF*). The authors thus obtained a fourth date of 15,537±65 $^{14}$C BP (OxA-38602, *Table 2*) (Prüfer *et al.* 2021). This is older than the dating obtained in Groningen (GrA-13696), but younger than the dates obtained from collagen in Mannheim (MAMS-36077) and from the amino acid hydroxyproline in Oxford (OxA-38022).

The Py-GC/MS analysis of the extracted collagen did not show peaks that could be attributed to the contaminant found in the untreated bone. This could be because the bone specimen was conserved with animal glue – a known conservation material for bones used in the 50s. Contamination by animal glue is difficult to assess because its main component is collagen (or gelatine), which produces the same pyrolysis products as the collagen of the bone itself. The glue would have a modern age, and its amount may vary across the bone because of the way it was applied and/or the porosity of the bone. This may explain the variability of the ages obtained while the technical data (e.g. C/N ratio) for dates on collagen and on hydroxyproline are all within the acceptable ranges. This hypothesis was later proved by DNA analyses, which show the presence of a high amount of animal DNA in in the human bones.

Due the modern contamination of the bone samples of Palaeolithic age, the oldest age in this instance, the HYP age, should most likely be considered a minimum age for the specimen (35,699–32,101 calBP) and the whole assemblage (Prüfer *et al.* 2021).

The Zlatý kůň specimen was a fifth- or sixth-degree relative of Ranis specimens R10873 and R10875, and more distantly related to the other Ranis individuals Ranis specimens R10873 and R10875 (Mylopotamitaki *et al.* 2024). Dating of this find (46,8–43,3 ka calBP) is so relevant for Zlatý kůň.

### 3.3 Archaeological artefacts

Research at Zlatý Kůň yielded six chipped stone artefacts, one naturally perforated seashell and a set of bone fragments bearing traces of dynamic impact resulting from intentional processing.

We were only able to precisely localise part of the assemblage from the first season, comprising three chipped stone artefacts, a shell and a worked bone fragment. These finds were collected in the distal part of the debris cone in the southern field, within a limited area of approximately four square metres, between transversal Profiles IV and VI, in Layer D (Prošek sd., Prošek 1952, Prošek *et al.* 1952) (*Figure 2*). The stratigraphic position on the profiles is indicated for artefact number 2 (see list below). These finds were found in the same space and stratigraphic position as the human skeletal remains. The remaining artefacts (numbers 6 to 14) are not localised, and are not mentioned in the primary publications from 1952,

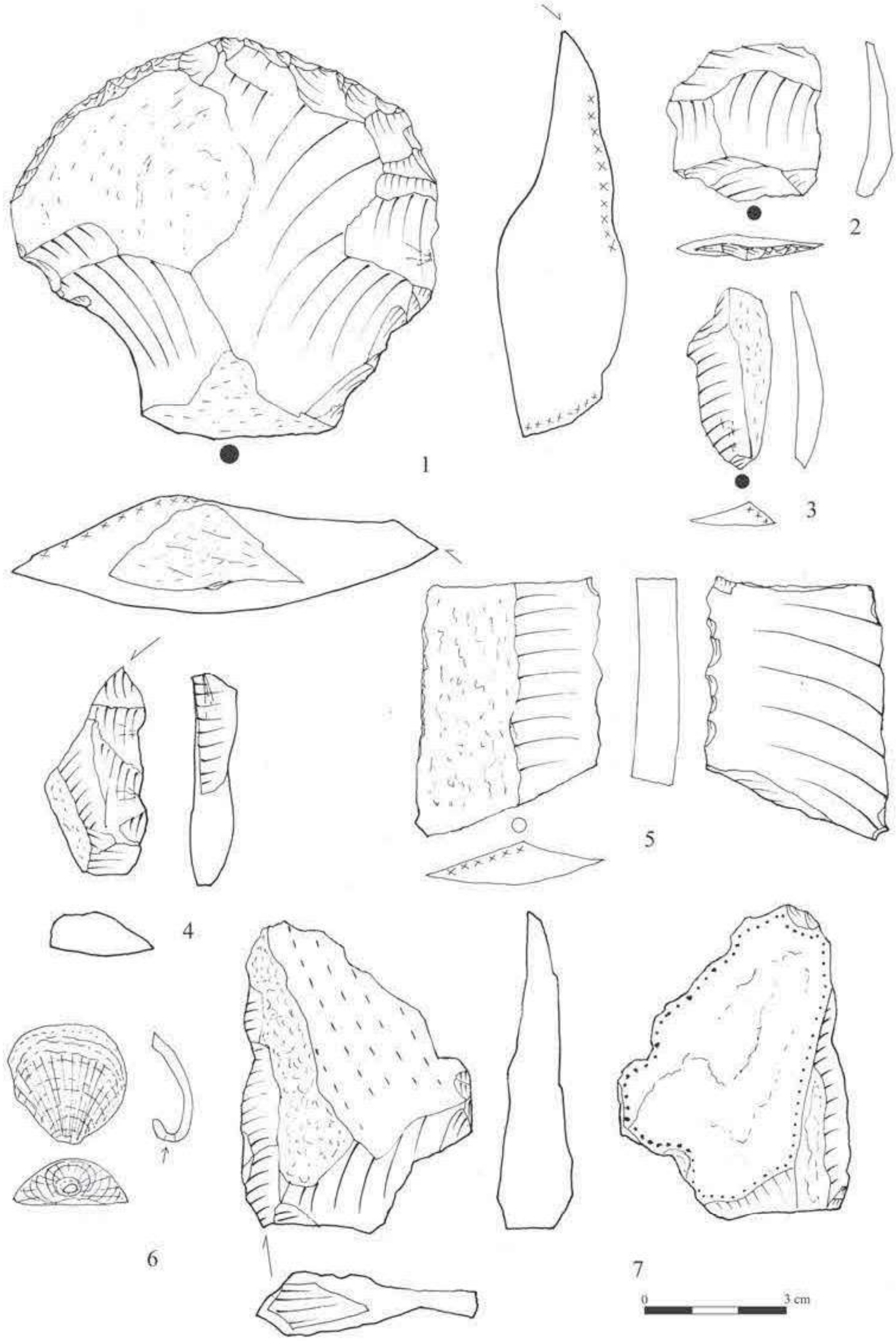


FIGURE 5: The Koněprusy Caves at Zlatý kůň Hill. Chipped stone industry (1–5, 7) and *Glycimeris* seashell (6). Drawn by P. Šída. 1 – scraper, 2–3 – flakes, 4,7 – burins, 5 – blade with lateral retouching, 1–3, 5 – chert of the Bohemian Karst type, 4 – quartz, 7 – limonitized siltstone, 1 – No. 16/6, 2 – No. 16/3, 3 – No. 16/8, 4 – No. 16/2, 5 – No. 16/1, 6 – No. 16/4, 7 – No. 16/7.

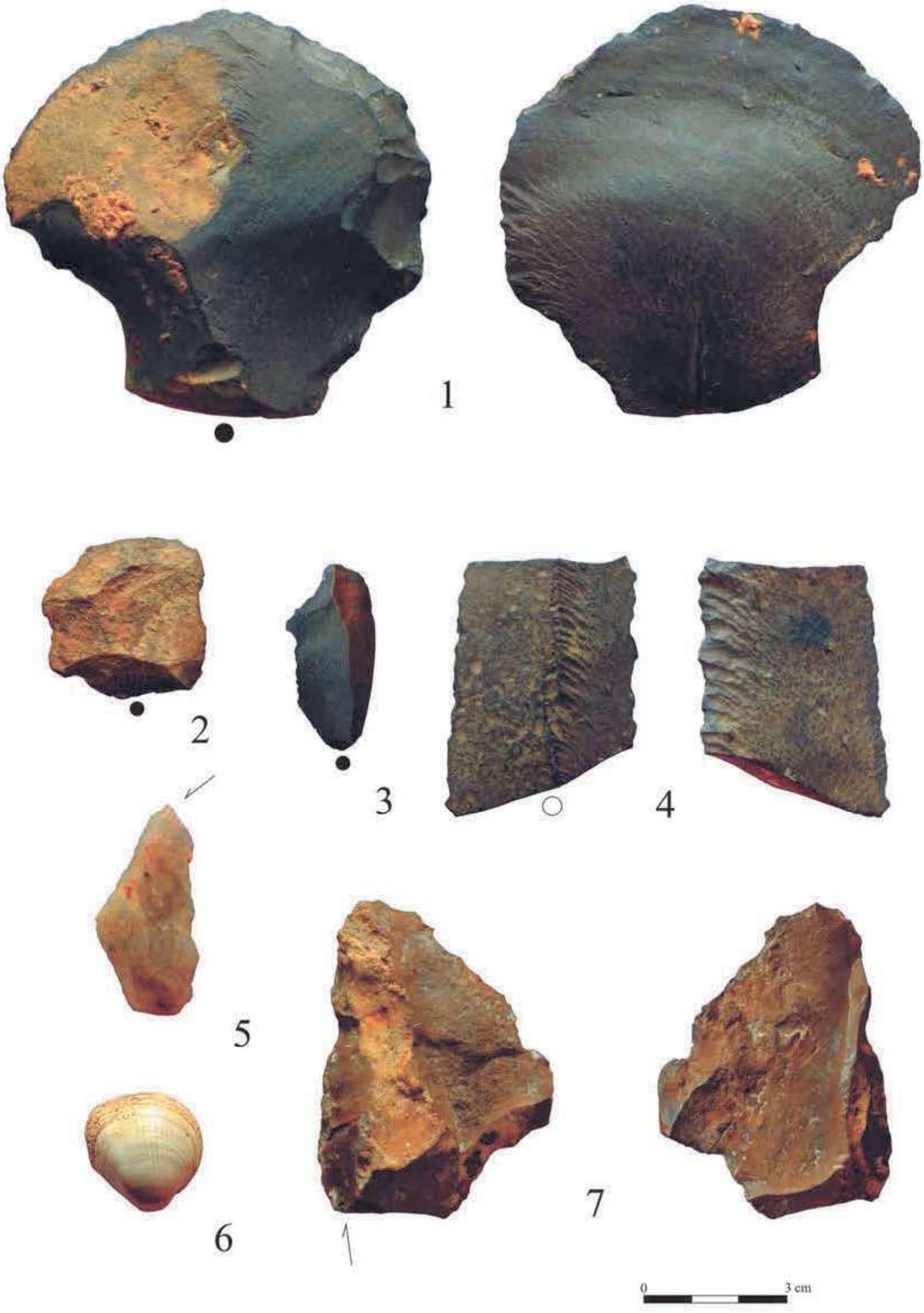


FIGURE 6: The Koněprusy Caves at Zlatý kůň Hill. Chipped stone industry (1–5, 7) and *Glycimeris* seashell (6). Photo by P. Šída. 1 – scraper, 2–3 – flakes, 4 – blade with lateral retouching, 5, 7 – burins, 1–4 – chert of the Bohemian Karst type, 5 – quartz, 7 – limonitized siltstone, 1 – No. 16/6, 2 – No. 16/3, 3 – No. 16/8, 4 – No. 16/1, 5 – No. 16/2, 6 – No. 16/4, 7 – No. 16/7.

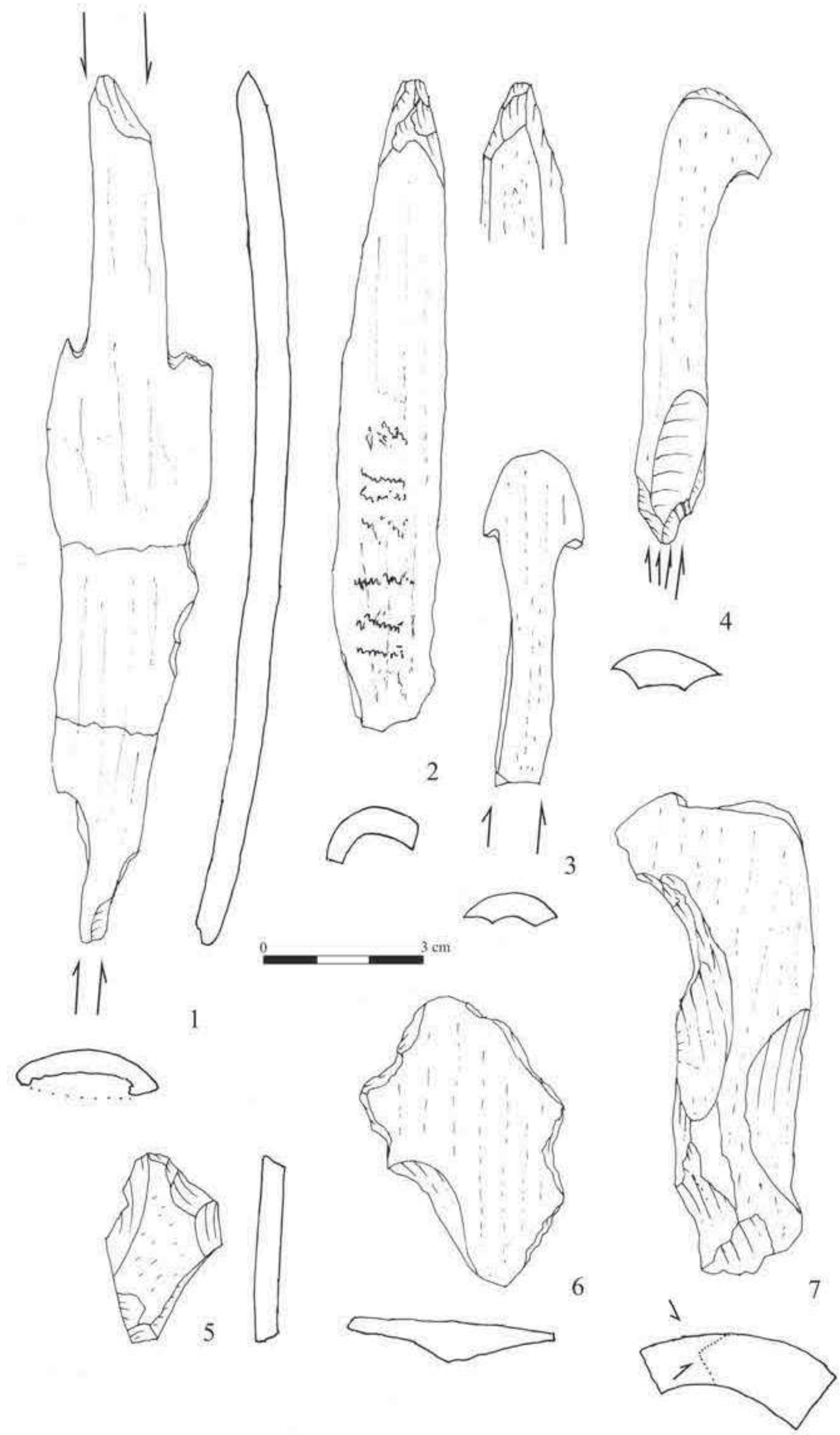


FIGURE 7: The Koněprusy Caves at Zlatý kůň Hill. Artefact from hard organic issues. 1 – point, 2 – pointed bone, 3–4 – bones with serie of burin blows, 5–6 – retouched bones, 7 – notched bone, 1 – No. 16/11, 2 – No. 16/12, 3 – No. 16/10, 4 – No. 16/9, 5 – 16/14, 6 – 16/13, 7 – 16/5.


FIGURE 8: The Koněprusy Caves at Zlatý kůň Hill. Artefact from hard organic issues. Photo by P. Šída. 1 – point, 2 – pointed bone, 3–4 – bones with serie of burin blows, 5–6 – retouched bones, 7 – notched bone, 1 – No. 16/11, 2 – No. 16/12, 3 – No. 16/10, 4 – No. 16/9, 5 – 16/14, 6 – 16/13, 7 – 16/5.

probably being unavailable at the time of their finalisation. They were probably discovered during the analysis of material samples, the survey of the northern ranges or the evaluation of the osteological material.

Inventorisation of all the finds was only carried out in 1971 by E. Vlček, one of the excavation authors, who certainly had extensive knowledge of the material obtained during the cave's investigation. The inventory respected the chronological sequence of the artefacts' discovery. According to the description, the blade was found first on 16 April 1951 and has the inventory number 16/1-1971. This is followed by a quartz burin (16/2-1971) and a flake (16/3-1971), both of which were found on 22 April 1951. A seashell with a natural hole was given the number 16/4-1971, and a bone with a notch was given the number 16/5-1971 (both of which were also found on 22 April 1951). These artefacts are mentioned by Prošek *et al.* (1952), and are certainly the five artefacts shown in the field plan in the southern part, between transversal Profiles IV and V (16 April 1951, 1 piece), and between transversal Profiles V and VI (22 April 1951, 4 pieces, Artefact 2 is recorded directly on transversal Profile V).

All the finds were first mentioned by K. Sklenář and J. Fridrich (1976), but their origins are not discussed. They also incorrectly apply Prošek's original information (Prošek *et al.* 1952) about the origin of the first five artefacts from an area of 1 m$^2$ to all artefacts. However, this area cannot be correct either because the five localised finds came from an area measuring 1 × 3.5 m, as shown on the original plan.

All finds are deposited in collection of Anthropological department of Natural Museum, National Museum in Prague. They are numbered by two number series. First, written in black is museum collection incremental number 16/1971 showing the evidence of finds in year 1971 by E. Vlček. The second numbering is written in red and dates back to the preparation of the National Museum's permanent prehistoric exhibition in the late 1960s. It was used to record exhibited objects, which were often collected from various institutions.

Description of the finds:

1. 16/1-1971, red number 2632 – central fragment of a massive blade with the lateral retouch, made from a nodule or pebble of chert of the Bohemian Karst type. Magnetic susceptibility: 0.01 × 10$^{-3}$ SI units. Natural surface cortex preserved on the dorsal side over 55% of area. Dimensions of artefact: 5.3 × 3.8 × 1 cm (*Figures 5:5 and 6:4*).
2. 16/2-1971, red number not preserved – burin on a fragment of aeolised quartz with 20% of the surface cortex preserved. The dimensions of the artefact are 4.4 × 2 × 0.9 cm (*Figures 5:4 and 6:5*).
3. 16/3-1971, red number illegible – flat flake with a prepared butt and a defined impact point. The right side of the butt shows abrasion or a remnant of faceting, and the left side shows abrasion to the surface of the the exploitation. It is made of a black silicite, which is locally covered with sinter. It is most likely a chert of the Bohemian Karst type. Its magnetic susceptibility is under the detection limit. The dimensions of the artefact are 3.3 × 3.3 × 0.65 cm (Prošek *et al.* 1952) incorrectly state 2.2 × 2 × 0.6 cm) (*Figures 5:2 and 6:2*).
4. 16/4-1971, red number illegible – *Glycimeris* sp. seashell with a natural hole, burrow originating from predatory molluscs. Its dimensions are 2.5 × 2.4 × 0.95 cm and the diameter of the hole is 0.2 cm (*Figures 5:6 and 6:6*).
5. 16/5-1971, red number not preserved – a fragment of a thick, long bone from a large mammal, bearing a retouched bifacial notch and traces of dynamic impact around its circumference. Dimensions: 8.8 × 3.5 × 1.8 cm (*Figures 7:7 and 8:7*).
6. 16/6-1971, red number 2631 – a scraper on a large flake with a butt, which entire surface is made up of natural cortex from the original pebble. There are two large negative marks on the dorsal side: the right one was made before the flake was extracted and the left one was made after. The bulbus is rather diffuse and the point of impact is spread over an area of 1.05 cm in length, indicating the use of a worn mineral hammer or anvil. The artefact is made of chert of Bohemian Karst type and corresponds to Artefacts 1 and 3. The measured magnetic susceptibility is 0.03 × 10$^{-3}$ SI units. The cortex of the original pebble makes up 40% of the dorsal surface of the artefact. Its dimensions are 8.7 × 8.95 × 2.5 cm (*Figures 5:1 and 6:1*).
7. 16/7-1971, red number not preserved – a burin on a fracture made of a frost-shattered fragment of a limonitized siltstone nodule. Its dimensions are 6.8 × 4.85 × 1.45 cm (*Figures 5:7 and 6:7*).
8. 16/8-1971, red number illegible – a blade-like flake with a pointed base, extracted with a mineral hammerstone, made from a nodule of chert of the Bohemian Karst type. The dorsal surface bears a natural cortex covering 40% of its area. Its dimensions are 3.8 × 1.8 × 0.55 cm. The raw material corresponds to Artefacts 1, 3 and 6. Magnetic

susceptibility is under the detection limit (*Figures 5:3 and 6:3*).

9. 16/9-1971, red number 2639 – a fragment of a thick, long bone from a large mammal, showing traces of several dynamic impacts around its circumference. Dimensions: 5.5 × 3.8 × 0.7 cm (*Figures 7:4 and 8:4*).
10. 16/10-1971, red number illegible – a fragment of a thick, long bone from a large mammal, showing traces of several dynamic impacts around its circumference. Dimensions: 3.5 × 2.2 × 0.6 cm (*Figures 7:3 and 8:3*).
11. 16/11-1971, red number not preserved – a fragment of a bone, probably a rib of a large mammal, with two parallel impacts along the longitudinal axis of the object (cf. a burin blow), creating a kind of tanged end. There are also two divergent impacts on the opposite end, which has been preserved in a more or less pointed shape. Dimensions: 16.3 × 3.1 × 0.7 cm (*Figures 7:1 and 8:1*).
12. 16/12-1971, red number not preserved – a fragment of a thick, long bone from a large mammal. There are signs of dynamic impacts on the pointed end and an animal bite mark on the outer side of the compact bone. The dimensions are 12.2 × 1.95 × 1 cm (*Figures 7:2 and 8:2*).
13. 16/13-1971, red number not preserved – a fragment of a thick, long bone from a large mammal, with an impact on both edges along the longitudinal axis of the object (cf. a burin blow), and a heavily abraded bone butt between them. Dimensions: 8.4 × 2.2 × 1.2 cm (*Figures 7:6 and 8:6*).
14. 16/14-1971, red number not preserved – a fragment of a thick, long bone from a large mammal, with two parallel impacts along the object's longitudinal axis (cf. a burin blow) on both edges. Dimensions: 6.2 × 1.8 × 0.65 cm (*Figures 7:5 and 8:5*).

## 4 DISCUSSION

Even at the time of the research, F. Prošek *et al.* (1952) concluded that the site could not be directly related to a settlement in the cave. At the time of the deposition of the finds, the only entrance to the dome was the narrow and impassable northern chimney, while the southern one had been closed in the Lower Pleistocene. The human body most likely entered the dome together with artefacts and the seashell, either by accidental fall or by intentional deposition as part of burial practices (Svoboda 2000). Over time, the individual disarticulated bones and fragments of equipment became scattered across the surface of the debris cone, forming the finds horizon. In the distal part of the cone subsequent sedimentation was minimal, and at the time of the research, the finds horizon was located on the cone's surface. Towards the chimney, the finds horizon was covered by a growing layer of sediments covering dispersed finds. This sedimentation covered the finds horizon during the end of MIS 3, when the northern chimney was largely filled. Subsequently, during MIS 2, the upper third of the chimney was filled with a mixture of fine dust and limestone clasts.

Geological dating is bounded on the one hand by the second half of MIS 3, as the latest possible time when the finds could have reached the cave before the chimney closed, and on the other by the beginning of MIS 3, as indicated by the thermophilic malacofauna MF3 found at the base of the last glacial layer (Layer E) below the finds horizon. This fauna is most likely from one of the interstadials at the beginning of MIS 3 (most likely GIS 14 to 16). The geological situation therefore suggests an age of 50–30 thousand callendric years BP. The hyena (*Crocuta crocuta spelaea*) bite marks on the human bones themselves suggest an age higher than the MIS 2 because this species disappeared from Central Europe during the glacial maximum (Varela *et al.* 2010). Sinters in the cave, formed during or just before the sedimentation of the finds layer, were dated to 55–45 ka calBP (GrN 27523: 45,500 ± 2,500–2,000 $^{14}$C BP).

The problem with the chronological classification arose from the initial radiocarbon dating (Svoboda *et al.* 2002, 2004), which dated the human bones to the end of the Pleistocene (GrA-13696: 12,870 ± 70 $^{14}$C BP, 15,611–15,169 calBP). This result contradicted the geological situation, but was ignored at the time of publication. It was only through the recent sequencing of the genome of Zlatý kůň 1 that this contradiction was resolved (Prüfer *et al.* 2021). Sequencing the human genome showed that the bones contain a high admixture of animal genome, which certainly originates from the modern glue used to preserve the bones in the 1950s. This glue contains modern collagen, which cannot be separated from archaic collagen during dating. The result is always mixed data, the value of which represents a minimum age. The oldest date obtained so far is OxA-38022, which is 29,650 ± 750 $^{14}$C BP and corresponds to a time period between 35.5 and 32 ka calBP.

However, genetic research shows that the real age of the find is even higher. The woman from Zlatý kůň is the individual with the shortest recorded distance to direct Neanderthal ancestors (70 generations), and the structure of the Neanderthal admixture clearly indicates that the meeting of Neanderthals and modern humans occurred outside Europe (Prüfer *et al*. 2021). Additionally, a close relationship with one individual from Ranis, dated to 47.5–43 ka calBP (Mylopotamitaki *et al*. 2024), has recently been demonstrated. According to genetic research, the finds from Zlatý kůň date to around 45 ka calBP, which is consistent with other dating methods.

The stone industry collection is very small, consisting of only six artefacts (*Figures 5 and 6*). Four of these are made of black silicite, which is classified as chert of the Bohemian Karst type. This material originates from the Choteč limestones outcrops between Prague and Beroun (Přichystal 2009). Its microscopic structure differs from that of the silicified Liteň slates. The presence of pebble cortex indicates that the raw material underwent water transport and was most likely brought from the bed of the nearby Berounka River.

In addition to the black silicites, the collection also features quartz with a naturally aeolian surface. It is certainly not a river pebble. The stone was probably collected somewhere on the Central Bohemian Tertiary plateaux; it is not possible to locate it more precisely than this, but the nearest possible locations are no more than 20 km away from the site. The final artefact is made of limonitized siltstone. It is most likely a silicified residue from the Tertiary weathering of karst landscapes, and is therefore a local raw material.

The collection of stone tools, consisting of two burins (*Figures 5:4, 7 and 6:5, 7*), a massive scraper (*Figures 5:1 and 6:1*) and a retouched wide blade (*Figures 5:5 and 6:4*), is culturally inconclusive. From a typological point of view, the artefacts do not deviate from the usual characteristics of EUP collections. They do not contain typical artefacts of the *fossile directeur* type, nor types that would exclude classification as an EUP industrie. Seven anthropogenically modified objects made of hard animal tissues, identified by F. Prošek, also fail to provide clues for a more precise cultural-chronological classification of the material found. The most notable of these is a point fashioned from a flat splinter of a large mammal's rib, created by a series of burin blows (*Figures 7:1 and 8:1*). No analogues for this type of artefact are known to us as yet. Another bone splinter next to it also has a pointed end (*Figures 7:2 and 8:2*). One bone bears a prominent notch retouched on both sides (*Figures 7:7 and 8:7*), and another two bones show burin blows as probably traces of use as a blow mediator (*Figures 7:3-4 and 8:3-4*). The remaining two pieces of bone are retouched into sharp rhomboid shapes (*Figures 7:5-6 and 8:5-6*). We are not aware of any comparable bone finds in the Central European milieu, but it should be noted that bone finds from this period are generally very rare. In any case, they differ techno-typologically from artefacts found for example in the Mladeč Caves (Oliva 2006).

A *Glycimeris* seashell with a natural hole was also found directly next to the localised artefacts (*Figures 5:6 and 6:6*). It could not have originated in Bohemia, its closest possible origin being the Vienna Basin in southern Moravia (*Figure 1*, 220 km away), or the northwestern Alpine Foredeep in southern Germany and northern Switzerland (300–500 km away). Alternatively, it could have been brought from the Mediterranean (700 km as the crow flies to the Adriatic coast at the time, or 1,300 km to the Aegean Sea or the Black Sea).

Although the hole in the shell is natural, it could still have been used as an ornament, as indicated by its long transport. The use of fossil shells within the EUP is evidenced by the Brno-Líšeň site, with the earliest data reaching back to around 43 ka calBP, with Jerzmanowice points appearing on site (Škrdla 2017: 106–110).

Although the stone artefact collection is neither numerous nor significant, an analogous assemblage can be found in the vicinity, as was first noted by F. Prošek *et al.* (1952) during their research. This assemblage originates from the large Nad Kačákem Cave, located only 6 km northeast of the Zlatý kůň Hill peak. It has thus far been dated to the 43–42.5 ka calBP horizon (Verpoorte, Šída 2009). Once again, we observe the dominance of local raw materials, particularly fine-grained black volcanic rock, palaeoandesite (Žák *et al*. 2022, 2024). The assemblage also features flakes from worked out cores with striking platforms, as well as a combination of massive blades and scrapers and side-scrapers. A flint point of the Jerzmanowice type was also found in the cave (Prošek 1947: fig. 13), but has not preserved into the present. Until recently, the Nad Kačákem Cave assemblage was classified as belonging to a late phase of the Middle Palaeolithic (Fridrich 1982), but it differs significantly from the Micoquien in having more worked out cores, a high proportion of blades, and a significant absence of bifacial retouching. Among more distant analogies, Jislova Cave in the Bohemian Paradise must be mentioned, as it yielded an assemblage of similar characteristics made predominantly from local raw materials (Fridrich 1982, Šída 2005).

Given the direct relationship between the woman from Zlatý kůň and two individuals from Ranis, neither can this site be neglected (Mylopotamitaki *et al*. 2024). Here, alongside numerous Jerzmanowice and leafshaped points, there is again a tendency to produce large blades and retouched large scrapers, similar to the Nad Kačákem Cave assemblage.

The initial penetration of modern humans into Central Europe is still poorly understood. The main problem lies in associating anthropological remains with the archaeological inventory. The most reliable collection of human remains and artefacts to date is associated with the Aurignacian culture in the Mladeč Caves (Teschler-Nicola Ed. 2006). The arrival of the first anatomically modern humans in Europe is often linked to the Bohunician culture (e.g. Svoboda, Bar-Yosef Eds. 2003, Tostevin 2000, Nigst 2012, Škrdla 2014, 2017). However, the industries of the same technological concept in Western Europe, which are often associated with the Middle Palaeolithic, must also be considered (e.g. Valoch *et al*. 2000). Due to the absence of human skeletal remains, we still cannot be certain about the association of AMH with Levallois-leptolithic industries *sensu lato* and related concepts (Škrdla 2017), which are particularly prevalent in Central Europe, especially in South Moravia, but have only a limited presence in Bohemia.

The findings from Ranis (Mylopotamitaki *et al*. 2024) have opened up new interpretative possibilities, suggesting that the Lincomb–Ranis–Jerzmanowice (LRJ) complex may represent the earliest evidence of AMH penetration into Europe as was suggested by Demidenko and Škrdla (2023). However, Flass (2011) previously emphasised the Neanderthal origin of this complex.

In light of the genetic affinity between the anthropological remains from Zlatý kůň and the Ranis find (Sümer *et al*. 2025), coupled with the absence of characteristic Aurignacian and Bohunician techno-typological elements as lack of high scrapers, levallois points and silicite use, we propose the hypothesis that the archaeological artefacts from Zlatý kůň may be associated with the LRJ complex.

## 5 CONCLUSIONS

A small collection of archaeological artefacts from the main dome of the Koněprusy Caves at the Zlatý kůň Hill, found alongside the skeletal remains of the Zlatý kůň 1 woman, sheds light on the transition between the Middle and Upper Palaeolithic periods and the arrival of anatomically modern humans in Europe. The stone tools, which are culturally unsubstantiated and contain a scraper and burins, are complemented by tools and anthropogenically affected bones, which have no analogues in the EUP inventories. While the entire collection has been impacted by various adverse influences related to excavation and post-excavation processes, which have a negative impact on the dating of the site in particular, DNA analysis indicates that the remains from Zlatý kůň belong to anatomically modern humans, constituting some of the earliest evidence of their presence in Europe. The closest analogy is probably not found in the Aurignacian, but rather in the LRJ complex, because both Zlatý kůň and Ranis sites are genetically close connected. Zlatý kůň would thus be an important addition to the debate about whether this complex was produced by Neanderthals, anatomically modern humans, or both. We are gradually building a much clearer picture of the development of Palaeolithic industries during MIS 3, which ultimately resulted in the dominance of modern humans.

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Petr Šída[1]*
Petr Neruda[2]
Antonín Přichystal[3]
Jan Eigner[1]
Rebeka Rmoutilová[4]
Petr Velemínský[1]

[1] Národní muzeum, Václavské náměstí 1700/68 110 00 Praha 1 – Nové Město
[2] Moravské zemské muzeum, Ústav Anthropos, Zelný trh 6, 659 37 Brno
[3] Přírodovědecká fakulta MU, Ústav geologických věd, Kotlářská 2, 611 37 Brno
[4] Přírodovědecká fakulta UK, Katedra antropologie a genetiky člověka, Viničná 1594/7, 128 00 Praha 2 – Nové Město

* Corresponding author.
E-mail: petrsida@seznam.cz